UNITED STATES
TELEPHONE
ASSOCIATION

USTA 100 Years 1897-1997

***Ex parte* Notice**

January 15, 1998

EX PARTE OR LATE FILED

RECEIVED

JAN 1

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, NW
Room 222
Washington, DC 20554

RE: CC Docket No. 96-45; Federal-State Joint Board on Universal Service and CC Docket No. 97-160 Forward-Looking Mechanism for High Cost Support for Non-Rural LECs

Dear Ms. Salas:

On January 14, 1998, Dr. Robert F. Austin, Dr. Mark E. Meitzen, Dr. Thomas J. Rutkowski, Dr. A. Thomas Bozza, John Schrotenboer, Mary McDermott, and Porter Childers representing the United States Telephone Association (USTA) met with Chuck Keller, Bob Loube, Emily Hoffnar, Bryan Clopton, William Sharkey, Richard Smith, Jeff Prisbrey, and Vaikunth Gupta of the Federal Communications Commission's Common Carrier Bureau. The purpose of this meeting was to provide additional comments on the most current generation of cost proxy models. USTA's comments are contained in the attached papers distributed at this meeting. They include (1) Dr. Austin's engineering evaluation of cost proxy models for determining universal service support: Hatfield Model Version 5.0, Benchmark Cost Proxy Model Version 3.0, and Hybrid Cost Proxy Model 2.0; and (2) Christensen Associates' economic analysis of Benchmark Cost Proxy Model 3.0, Hafield Model Version 5.0, and Hybrid Cost Proxy Model.

USTA remains seriously concerned regarding the use of a proxy model for purposes of calculating universal service support as discussed in its prior comments filed in this proceeding and consequently is not endorsing the concept of such a model nor any individual model. However, USTA will continue to examine the proxy models under consideration and will provide the FCC the results of its analyses for inclusion in the public record.

An original and a copy of USTA's *ex parte* filing are being filed in the Secretary's office on January 15, 1998. Please include this filing in the public record of the above-mentioned proceedings.

Respectfully submitted,

Porter E. Childers

Porter Childers
Executive Director-
Legal & Regulatory Affairs

cc: Chuck Keller
Bob Loube
Emily Hoffnar
Bryan Clopton
William Sharkey
Richard Smith
Jeff Prisbrey
Vaikunth Gupta

1401 H STREET NW SUITE 600 WASHINGTON DC 20005 2164 TEL 202 326 7300 FAX 202 326 7333 INT www.usta.org

Analysis of Benchmark Cost Proxy Model 3.0, Hatfield Model, Version 5.0 and Hybrid Cost Proxy Model

Christensen Associates
January 13, 1998

Introduction

- Evaluate model platforms with respect to FCC's 10 criteria

- Compare results of latest versions of models
  - Five states--Florida, Georgia, Maryland, Missouri, and Montana
  - Default runs
  - Standardized inputs

- Proxy model scorched node approach
  - Does not accurately reflect costs of dynamically efficient actual market participant
  - Not suited to model cost levels
  - Best they can do is to reflect relative costs to identify high-cost areas

Evaluation with respect to FCC criteria

- Focus on BCPM3.0 and HM5.0. HCPM is incomplete

- Criterion 1
  - Both models partially satisfy
    - Least-cost decisions tend to be based on investments and not total lifecycle costs
    - HM5.0 default does not include high-speed services
    - HM5.0 default does not model host, remote and stand-alone locations, or the transport network configured to serve these types of switches
    - Not likely to model costs of actual dynamically efficient firm
      - scorched node
      - general rules with publicly available data
    - Need to validate whether wire center line counts are accurate - data not publicly available to do this
    - BCPM3.0 presents loop lengths on reports, HM5.0 does not

- Criterion 2
  - BCPM3.0 now explicitly models transport and signaling
  - HM5.0 still deficient on switching; doesn't model transport for 5 companies

- Criterion 3
  - Scorched node doesn't reflect costs of efficient actual market participants
  - General nature and reliance on publicly available data limits how well models can reflect forward-looking, least-cost approach for all situations
  - Input prices are long way from being validated
  - HM5.0's forward-looking expense factor is arbitrarily set at 50% of embedded

- Criterion 4
  - Both allow FCC 11.25% - BCPM3.0 has pre-set "FCC Scenario for cost of capital and depreciation
  - Default results for both based on models' previous cost of capital
    - BCPM3.0 – 11.39%
    - HM5.0 – 10.01%

- Criterion 5
  - Both allow for FCC-authorized economic lives and salvage percentages
  - HM5.0 defaults mostly fall within FCC range, BCPM3.0 default lives shorter for several key accounts

- Criterion 6
  - BCPM3.0 controls lines to state level; HM5.0 controls to company levels, using a variety of sources and years (1993-1997) for controls
  - BCPM3.0 models DS-1 special circuits, HM5.0 does not

- Criterion 7
  - Both include an allocation of joint and common costs as before
  - No economic foundation to determine reasonable allocation

- Criterion 8
  - Not all data is verifiable - both models do a substantial amount of exogenous processing (customer location)
    - BCPM3.0 - Census block data is assigned to ultimate grids outside model
    - HM5.0 - cannot verify accuracy of geocoding, high licensing cost of Metromail
  - Dispute over accuracy of geocoding
    - Even if 90% of addresses are contained, what is accuracy?
    - What happens with P.O. Boxes and Rural Routes?

- Criterion 9
  - Do not comply with respect to customer location algorithms and data

- Criterion 10
  - Both produce support calculations at wire center level and are capable of producing results at CBG level

- BCPM3.0 can produce results below CBG level

Summary of evaluation with respect to FCC criteria

- Both models have improved, but are not in compliance
- BCPM3.0 platform appears to be more advanced, as network is more consistent with forward-looking principles and is more able to provide range of services enumerated in FCC criteria
- Key area of dispute - customer location
  - Neither BCPM3.0 nor HM5.0 allow full validation
  - HCPM reveals all source code
- Proxy models are proxy models - they are hypothetical

Comparison of Model Results

- Compared results for Florida, Georgia, Maryland, Missouri and Montana
- Default values still over 40 percent apart
- Standardized inputs - results still 20 percent apart
  - structure sharing 100%
  - cost of capital 11.39%
  - FCC asset lives and net salvage, straight-line depreciation
  - $11.34 per line expense loading
  - no high-speed circuits
- Have not been able to standardize input prices

Model Operation

- Both models more difficult to install and run
- HM5.0 user interface unchanged - applying large number of parameter changes to multiple states is tedious
- BCPM3.0 user interface revised - had major problems with macros that update parameter values
- BCPM3.0 processes at state level, HM5.0 does not
- Once processed BCPM3.0 offers significantly more flexible reporting capabilities
- HCPM require great degree of programming sophistication and is not easily evaluated

Conclusions

- Remaining differences due to differences in input price, basic loop engineering and customer location
- Customer location is a key issue to be resolved
- Operation of both models very difficult and both have problems

- HCPM incomplete and difficult to evaluate – appears to have problems with distance calculations
- Proxy models are proxies

Tables Comparing BCPM3.0 to HM5.0
Default Values

Table 4
Average Monthly Cost Per Line – BCPM3.0 and HM5.0
Default Results

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$30.78	$38.42	$28.49	$46.17	$111.82	$36.04
HM5.0	$16.26	$22.22	$16.35	$27.78	$68.87	$20.58
HM5.0/BCPM3.0	-47%	-42%	-43%	-40%	-38%	-43%

Table 7
Total Investment Per Line – BCPM3.0 and HM5.0
Default Results

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$1,248	$1,730	$1,099	$2,238	$6,573	$1,587
HM5.0	$685	$984	$659	$1297	$3,270	$902
HM5.0/BCPM3.0	-45%	-43%	-40%	-42%	-50%	-43%

Table 8
Loop Investment Per Line - BCPM3.0 and HM5.0
Default Results

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$922	$1,348	$767	$1,709	$5,684	$1,206
HM5.0	$515	$713	$480	$778	$2,015	$628
HM5.0/BCPM3.0	-44%	-47%	-37%	-54%	-65%	-48%

Table 9
Switch Investment Per Line - BCPM3.0 and HM5.0
Default Results

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$236	$266	$250	$377	$463	$270
HM5.0	$115	$143	$121	$126	$202	$125
HM5.0/BCPM3.0	-51%	-46%	-52%	-67%	-56%	-54%

Table 10
Other Investment Per Line - BCPM3.0 and HM5.0
Default Results

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$90	$117	$81	$153	$426	$111
HM5.0	$56	$127	$58	394	$1,052	$148
HM5.0/BCPM3.0	-38%	9%	-29%	158%	147%	34%

Tables Comparing BCPM3.0 to HM5.0 Standardized Values

Table 11
Average Monthly Cost Per Line – BCPM3.0 and HM5.0
Standardized Inputs

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$28.61	$35.50	$26.50	$42.31	$102.21	$33.33
HM5.0	$23.68	$29.21	$22.99	$36.73	$78.52	$28.10
HM5.0/BCPM3.0	-17%	-18%	-13%	-13%	-23%	-16%

Table 13
Total Investment Per Line – BCPM3.0 and HM5.0
Standardized Inputs

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$1,264	$1,753	$1,113	$2,254	$6,581	$1,604
HM5.0	$821	$1,151	$793	$1,534	$4,446	$1,084
HM5.0/BCPM3.0	-35%	-34%	-29%	-32%	-32%	-32%

Table 14
Loop Investment Per Line – BCPM3.0 and HM5.0
Standardized Inputs

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$937	$1,363	$780	$1,724	$5,691	$1,220
HM5.0	$651	$881	$614	$1,015	$2,751	$800
HM5.0/BCPM3.0	-31%	-35%	-21%	-41%	-52%	-34%

Table 15
Switch Investment Per Line – BCPM3.0 and HM5.0
Standardized Inputs

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$236	$272	$251	$377	$463	$272
HM5.0	$115	$143	$121	$126	$202	$125
HM5.0/BCPM3.0	-51%	-47%	-52%	-67%	-56%	-54%

Table 16
Other Investment Per Line – BCPM3.0 and HM5.0
Standardized Inputs

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$91	$118	$82	$153	$427	$112
HM5.0	$56	$127	$58	$394	$1,493	$158
HM5.0/BCPM3.0	-39%	7%	-30%	157%	250%	42%

Table 17
Average Monthly Cost Per Line - BCPM3.0 and HM5.0
Standardized Inputs, No High-Speed Circuits

	Florida	Georgia	Maryland	Missouri	Montana	Wtd Avg
BCPM3.0	$29.77	$37.37	$27.45	$44.99	$112.52	$35.03
HM5.0	$23.68	$29.21	$22.99	$36.73	$78.52	$28.10
HM5.0/BCPM3.0	-20%	-22%	-16%	-18%	-30%	-20%

FCC's Model Evaluation Criteria

1. *The technology assumed in the cost study or model must be the least-cost, most efficient, and reasonable technology for providing the supporting services that is currently being deployed. A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers. The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services. We note that the use of loading coils is inconsistent with the Rural Utilities Services guidelines for network deployment by its borrowers. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.*

2. *Any network function or element, such as loop, switching, transport, or signaling necessary to produce supported services must have an associated cost.*

3. *Only long-run forward-looking economic cost may be included. The long-run period used must be a period long enough that all costs may be treated as variable and avoidable. The costs must not be the embedded cost of the facilities, functions, or elements. The study or model, however, must be based upon an examination of the current cost of purchasing facilities and equipment, such as switches and digital loop carriers (rather than list prices).*

4. *The rate of return must be either the authorized federal rate of return on interstate services, currently 11.25 percent, or the state's prescribed rate of return for intrastate services. We conclude that the current federal rate of return is a reasonable rate of return by which to determine forward looking costs.*

5. *Economic lives and future net salvage percentages used in calculating depreciation expense should be within the FCC-authorized range. We agree with those commenters that argue that currently authorized lives should be used because those assets used to provide universal service in rural, insular, and high cost areas are unlikely to face serious competitive threat in the near term.*

6. *The cost study or model must estimate the cost of providing service for all businesses and households within a geographic region. This includes the provision*

of multi-line business services, special access, private lines, and multiple residential lines.

7. *A reasonable allocation of joint and common costs should be assigned to the cost of supported services. This allocation will ensure that the forward-looking economic cost does not include an unreasonable share of the joint and common costs for non-supported services.*

8. *The cost study or model and all underlying data, formulae, computations, and software associated with the model should be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.*

9. *The cost study or model should include the capability to examine and modify the critical assumptions and engineering principles. These assumptions and principles include, but are not limited to, the cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.*

10. *The cost study or model must deaverage support calculations to the wire center serving area level at least, and, if feasible, to even smaller areas such as a Census Block Group, Census Block, or grid cell. We agree with the Joint Board's recommendation that support areas should be smaller than the carrier's service area in order to target efficiently universal service support.*

Analysis of Benchmark Cost Proxy Model 3.0, Hatfield Model, Version 5.0 and Hybrid Cost Proxy Model

Mark E. Meitzen, A. Thomas Bozzo, Thomas J. Rutkowski, and Travis C. Grau
Christensen Associates
January 14, 1998

I. Introduction

Christensen Associates has been retained by the United States Telephone Association (USTA) to evaluate the most recent generation of cost proxy models. In this report, we evaluate: the Benchmark Cost Proxy Model 3.0 (BCPM3.0), sponsored by BellSouth, US WEST and Sprint Local Telephone Companies; the Hatfield Model, Version 5.0 (HM5.0), sponsored by AT&T and MCI; and the Hybrid Cost Proxy Model (HCPM), developed by staff members of the Federal Communications Commission (FCC) and an outside consulting engineer.[1] Christensen Associates has undertaken two previous evaluations of cost proxy models on behalf of the USTA[2] and has outlined appropriate standards for cost models and methodologies also on behalf of the USTA.[3]

The FCC has separated the review of proxy models into two phases: a review of model platforms and a review of model inputs. The primary focus of our current analysis is to evaluate the model platforms (i.e., model algorithms and assumptions)

[1] The versions of BCPM3.0, HM5.0 and HCPM we examine in this analysis were all released on December 11, 1997.
[2] "Economic Evaluation of Proxy Cost Models for Determining Universal Service Support," Christensen Associates, January 9, 1997; and "Analysis of Benchmark Cost Proxy Model and Hatfield Release 3.1," Christensen Associates, April 23, 1997.
[3] "Appropriate Standards for Cost Models and Methodologies," Christensen Associates, February 13, 1997.

with respect to the ten criteria for cost models or cost studies established by the FCC in its Universal Service Order.[4]

We also compare the results of the latest versions of the models for the following states that were available for both BCPM3.0 and HM5.0 at the time of our analysis: Florida, Georgia, Maryland, Missouri, and Montana. We draw comparisons to HCPM where appropriate. However, analysis of HCPM is significantly restricted at this time due to the incomplete nature of the HCPM model. Currently HCPM only models loop investment. Other network elements needed to provide service, such as switching, transport and signaling, are not currently modeled by HCPM. In addition, HCPM model builders have not made public any capital or operating expense modules.[5]

In this report, we conclude that neither BCPM3.0 nor HM5.0 fully satisfies the FCC's ten criteria. In terms of model platforms, BCPM3.0 appears to be more consistent with the FCC's criteria at this time. A key area that requires further investigation and validation is customer location. Because both BCPM3.0 and HM5.0 do a substantial amount of exogenous processing and not all customer location data is readily verifiable, the accuracy of each model's customer location modules is difficult to assess at this time.

Even after standardizing a number of key inputs, there is still an average difference of 20 percent in monthly costs per line between BCPM3.0 and HM5.0.

[4] Federal-State Joint Board on Universal Service (Joint Board), CC Docket No. 96-45, Report and Order, FCC 97-157, May 8, 1997 ("Universal Service Order"), para. 250.

[5] In his analysis of the CENBLOCK and FEEDDIST modules comprising HCPM, Robert F. Austin concludes that HCPM is susceptible to user manipulation and it uses an inappropriate distance metric in modeling its network. See Robert F. Austin, "Comment on the Hybrid Cost Proxy Model for Determining Universal Service Support for Non-Rural Carriers: The CENBLOCK and FEEDDIST Software Modules," December 2, 1997.

This is most likely due to differences in input prices (which were not standardized in this analysis), basic loop engineering, and customer location methods. Therefore, it appears that there has not been much, if any, convergence between the models.

Before commencing with our analysis of the current versions of the proxy models, it is important to understand what proxy models do and do not represent. The underlying basis of the proxy models, namely their scorched node approach to building and costing telecommunications networks, must be fully understood. As we have stated previously, such a modeling approach is not likely to accurately reflect the costs of a dynamically efficient actual market participant—whether the participant is an incumbent or an entrant:

> "The idealized statically efficient entrant interpretation does not represent the performance of an actual entrant or incumbent who is dynamically efficient. Actual entrants and incumbents, who are dynamically efficient, will generally deviate from this ideal because of uncertainty, the capital intensive nature of the telecommunications industry, and its rapid rate of technological change. Therefore, if rates were strictly based on the cost levels produced from models adhering to the idealized standard of instantaneous static efficiency, cost recovery problems would be created for both incumbent LECs and actual market entrants."[6]

Because of these limitations, we previously concluded that while proxy models could be developed to adequately reflect relative costs to identify high-cost areas to serve, proxy models are not suited to accurately reflect actual forward-looking cost levels of actual market participants:

> "Proxy models were initially developed to identify high-cost areas for universal service funding purposes and have evolved into multiple-use models. While proxy models may be useful for determining relative cost relationships between high-cost and low-cost areas for purposes of targeting a given size universal service fund, their suitability for determining cost levels for network elements or services, such as access, is limited. This is because the

[6] "Appropriate Standards for Cost Models and Methodologies," p. 9.

information requirements to develop company-specific or geographic-specific costs for network elements or services is much greater than can be developed from the broad, publicly-available data sources used by the proxy models. At the very least, company or area-specific inputs are required to accomplish this task."

"Moreover, the efficient design of actual networks in specific geographic locations is likely to vary from those generated by the broad assumptions contained in the proxy model network designs. Again, this makes it very difficult for general proxy models to adequately capture the true cost characteristics of efficiently-designed actual networks that are needed to establish cost levels." [7]

Section II of this report summarizes the main changes in BCPM3.0 and HM5.0 relative to their predecessors. Section III evaluates the models with respect to the FCC's criteria. Section IV compares results of the current versions of the models and also standardizes inputs to facilitate an "apples-to-apples" assessment of the model platforms. In Section V, we comment on the operation of the current versions of the models. Section VI presents our conclusions.

II. Summary of Model Changes

Both BCPM3.0 and HM5.0 have undergone significant changes since our last evaluation of BCPM1.1 and HM3.1. Below is a summary of those changes.

Changes in BCPM3.0 from Previous Versions of BCPM

According to the BCPM3.0 documentation, the following changes are incorporated into BCPM3.0:[8]

- The model uses housing and business line data at the Census Block (CB) level, overlays microgrids upon CBs and accounts for the actual

[7] Id., p. 11.
[8] "Benchmark Cost Proxy Model Release 3.0 Model Methodology," BellSouth, INDETEC International, Sprint and US WEST, December 11, 1997 ("BCPM3.0 Documentation"), pp. 6-8.

road network to locate customers within a CB. Optimal grid size is based on efficient network design.

- Wire center boundaries are specified by Business Location Research (BLR) to assign customers to the appropriate wire center and local exchange carrier.
- Customers are no longer assumed to be uniformly distributed throughout the CBG.
- The switch module allows for host, remote and stand-alone switches and has separate cost curves for each switch type.
- The transport module designs SONET rings for transport.

The following features are the same as previous versions of BCPM:

- Default cost of capital.
- Default expenses (although can be stated on per-line or ratio to investment).
- Default structure sharing.

Changes in HM5.0 from to Previous Versions of HM

According to the HM5.0 manual, the following changes are reflected in HM5.0:[9]

- Customer locations are geocoded. Clusters of customers that may be served efficiently together are identified.
- Outside plant is suited to particular local conditions.
- Explicit specification of host, remote and stand-alone switches.
- Interoffice SONET transport rings.
- Expenses can be allocated based on lines or investment.

The following features are the same as previous versions of HM:

- Default switch investment curve.
- Default structure sharing.
- Default capital cost.
- Default variable overhead factor.

While there have been significant changes made to both models, there are still some areas where the models have retained some of the features of previous versions. Many of these unchanged features fall within the area of input values--

[9] "Hatfield Model Release 5.0 Model Description," HAI Consulting, December 11, 1997 ("HM5.0 Documentation") , p. 4.

such as cost of capital, expenses, and structure sharing percentages—and, therefore, are outside the scope of the current model platform analysis.[10] However, one such feature that has been retained by HM5.0 and can be categorized as a platform issue is switching. HM5.0 still relies on the same questionable switching curve found in previous versions of the Hatfield Model. From HM5.0 documentation:

> "In default mode, the model assumes a blended configuration of switch technologies. The switching cost curves for this blended configuration were developed using typical per-line price paid by BOCs, GTE and other independents as reported in the Northern Business Information (NBI) publication, 'U.S. Central Office Equipment Market: 1995 Database.'"[11]

Even though the HM sponsors call their switch curve a "blended configuration of switch technologies" and assert that HM5.0 incorporates an "explicit specification of host, remote and stand-alone switches,"[12] the HM5.0's default switching module is essentially unchanged from the deficient switching module found in previous versions of HM.[13] This is despite the FCC's recommendation that individual switches be identified as host, remote, or stand-alone, and that there be separate cost curves for host, remote and stand-alone switches.[14]

III. Evaluation of Proxy Models with Respect to FCC Criteria

---

[10] In the BCPM3.0 Documentation, developers of the BCPM acknowledge that they have spent almost all of their efforts on platform development and refinement, leaving inputs unchanged from BCPM1.1.

[11] HM5.0 *Documentation*, p. 52.

[12] HM5.0 Documentation, p. 4.

[13] For example, see "Joint Reply Comments of BellSouth Corporation, BellSouth Telecommunications, Inc., US WEST, Inc., and Sprint Local Telephone Companies to Further Notice of Proposed Rulemaking," CC Docket No. 96-45 and 97-160, August 18, 1997 ("Joint Reply Comments"); and "Comments of GTE Service Corporation," CC Docket No. 96-45 and 97-160, August 8, 1997.

[14] "Guidance to Proponents of Cost Models in Universal Service Proceeding: Switching, Interoffice Trunking, Signaling, and Local Tandem Investment," Public Notice, DA 97-1912, September 3, 1997.

Paragraph 250 of the Universal Service Order contains 10 criteria prescribed by the FCC that must be met by any cost model or methodology to ensure the appropriate calculation of universal service support.[15] In this section, we evaluate each of the proxy models with respect to these criteria. Each criterion is listed separately below, immediately followed by our analysis of the proxy models with respect to that criterion. Given the incomplete nature of the HCPM, the focus of this evaluation will be on BCPM3.0 and HM5.0. Comments on HCPM will be included where appropriate.

A. Evaluation of Proxy Models

1. *The technology assumed in the cost study or model must be the least-cost, most efficient, and reasonable technology for providing the supporting services that is currently being deployed. A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers. The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services. We note that the use of loading coils is inconsistent with the Rural Utilities Services guidelines for network deployment by its borrowers. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.*

There are actually four requirements contained in Criterion 1. We examine them separately below.

1a. "The technology assumed in the cost study or model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed."

[15] Supported services include: single-party service; voice grade access to the public switched network; Dual Tone Multifrequency (DTMF) signaling; access to emergency services; access to operator services; access to interexchange services; access to directory assistance; and toll limitation services for qualifying low-income consumers. See Universal Service Order, para 56.

Subject to the qualification that the forward-looking costs of a hypothetical scorched node network will not likely reflect the cost of a dynamically efficient actual market participant, both the BCPM3.0 and HM5.0 partially satisfy this criterion. However, because of the general nature of proxy models and their primary reliance on publicly available data, none of the models fully integrates the engineering requirements with an economic assessment of the least-cost technology required to satisfy the engineering requirements. What is required is, first, an assessment of the minimal engineering requirements needed to provide the defined set of services. The services include not only supported services, but taking Criteria 1 and 6 together, also include advanced services, multi-line business services, special access, private lines, and multiple residential lines. Once the engineering parameters to provide these services are specified, an economic analysis of the least-cost way of provisioning these services over the lifetime of the requisite investments is required.

For example, in its default mode, HM5.0 does not optimize its network over the services outlined by the FCC criteria and, therefore, does not perform the appropriate least-cost network calculations. Although the network engineered by BCPM3.0 models high-speed circuits, BCPM3.0 does not appear to fully analyze the least-cost approach of constructing the network over the lifecycle of the required investments. It should also be noted that, at this point in its development, HCPM is not capable of modeling the least-cost life cycle costs. This is because HCPM only models investments and does not have an expense module. Thus, HCPM cannot account for expenses over the lifetime of investments.

Both BCPM3.0 and HM5.0 employ feeder steering to guide main feeder routes toward population centers. While neither model accounts for natural obstacles, such as lakes or mountains, in steering feeder routes to population centers, this technique will tend toward more efficient use of feeder cable. Of the two models, HM5.0 is the most efficient in placing sub-feeder cable. HM5.0 places sub-feeder cables perpendicular to main feeder routes. BCPM3.0, on the other hand, will route sub-feeder cable in one of the cardinal directions to reach a serving area. This can result in more sub-feeder cable being placed by BCPM3.0.

HM5.0 does not adequately account for the least-cost, most-efficient switching technology. As noted above, HM5.0 still relies on the same switching module as previous versions of the Hatfield Model. This switching module does not adequately account for identification of host, remote and stand-alone switches per the FCC's recommendation.[16] This also has implications for HM5.0's transport costs. Since HM5.0 does not adequately identify host, remote and stand-alone locations, it cannot place the appropriate quantity and type of transport facilities between switch locations. For example, HM5.0 cannot adequately account for host-remote links in its transport facilities, nor the efficient quantity and routing of transport facilities between switching entities. In fact, as GTE has pointed out, the hypothetical transport network constructed by the Hatfield Model is inconsistent with forward-looking switch designs and resulting route designs.[17]

BCPM3.0 does allow for separate cost curves for host, remote and stand-alone switches and identifies their locations. This is an improvement over previous

[16] Public Notice, DA 97-1912, September 3, 1997.
[17] GTE Comments, August 8, 1997.

versions of BCPM and over HM5.0. However, because BCPM3.0 relies on the placement of switch types found in Bellcore's LERG, the decision as to whether to deploy host, remote or stand-alone switches is partially an embedded decision.[18]

> *1b. "A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers. "*

Both models design their networks from scratch keeping wire center locations fixed—i.e., a "scorched node" approach. Neither model takes a scorched-earth approach to network design (where the network would be designed from scratch with wire centers being located to minimize costs).

> *1c. "The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services. We note that the use of loading coils is inconsistent with the Rural Utilities Services guidelines for network deployment by its borrowers."*

The network designed by BCPM3.0 is capable of providing advanced services. In fact, the proportion of high-speed circuits modeled by BCPM3.0 varies by the number of lines per grid, with the proportion of high-speed circuits increasing as the number of lines per grid increases. Presumably, this reflects differences in business concentration. However, in its default mode, HM5.0 does not model high-speed circuits and, therefore, is not capable of providing advanced services. Thus, HM5.0 is not in compliance with the FCC requirements on this point (nor is it in

[18]The BCPM3.0 sponsors note that, because the proxy models rely on publicly-available information, it is not possible to perform a truly forward-looking optimization of switch type placements. Such a decision would require use of confidential vendor and LEC data. See Joint Comments, CC Docket 96-45 and 97-160, August 8, 1997, Attachment 1, pp. 1-2.

compliance with Criterion 6). While the user can account for high-speed circuits in HM5.0, the proportion cannot be altered by the number of lines per grid as in BCPM3.0.

An indication of the differences in engineering required to provide various services is found in the different approaches to choosing cables gauges between the two models. HM5.0 makes the decision to use 24-gauge versus 26-gauge based solely on the number of pairs in the cable. BCPM3.0 accounts for line resistance in the decision to use 24-gauge versus 26-gauge cable.

> *1d. "Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length."*

Both models use wire center boundaries provided by Business Location Research, Inc. (BLR). Previous versions of each model had assigned Census Block Groups (CBGs) to the nearest serving wire center. As a result, many customers were incorrectly assigned to the wrong wire centers. Both models now identify customer locations with a much finer resolution, leading to much more accurate wire center assignments.

To validate the models according to this criterion, we would need to know LEC line counts by wire center in order to have a value to compare the models' output to. To our knowledge, such data have not been made publicly available. Unless each LEC has performed a study to calculate average loop lengths, these data are not readily available either. The best most companies could do is estimate route miles or conductor miles. Route and conductor mile statistics do not represent loop lengths because of different fill characteristics.

Line count controls for both BCPM3.0 and HM5.0 are at high levels of aggregation. BCPM3.0 controls lines to state totals and HM5.0 controls lines to company totals. In both instances, line totals at lower levels of aggregation (such as wire center or CBG) are estimates based on some allocation procedure.

BCPM3.0 still uses a residential line multiplier that can be multiplied by the number of households in each "ultimate grid" to estimate the number of lines. The residential line multiplier is calculated by dividing the statewide number of residential access lines by the statewide number of households. For statewide runs, BCPM3.0 results will be more accurate because the totals are controlled to NECA reported line counts. Line counts at the wire center level are not controlled to actual reported lines.

HM5.0 controls to actual line counts reported by each company. The model's developers estimated company line counts where reported line counts were unavailable. This method will only result in accurate line counts at the company level for only those companies whose line counts have not been estimated. Similar to BCPM3.0, HM5.0 can only provide estimates of line counts at the wire center level.

BCPM3.0 clearly presents its calculated average loop lengths on its reports. HM5.0, on the other hand, leaves the calculation of average loop lengths up to the user. Average feeder and distribution lengths are available in the workfile, but only for each cluster. The user would need to construct a weighted average loop length over all of the clusters in order to estimate loop lengths at the wire center level. Since HM5.0 still does not summarize results at the state level, constructing a statewide weighted average loop length would entail a great deal of spreadsheet programming.

2. *Any network function or element, such as loop, switching, transport, or signaling necessary to produce supported services must have an associated cost.*

Both HM5.0 and BCPM3.0 produce costs for all network elements. However, this is not to say that the costs produced by the models are appropriate or accurate. For example, as we discussed above, in its default mode, the HM5.0 network does not include any switched or special service high-speed circuits, such as DS-1 or DS-3. As a result, HM5.0 fails to account for any economies of scope that result from including these advanced services in the network design. We also noted that HM5.0's switching and transport costs do not reflect the forward-looking costs that would be incurred by an actual market participant.

In previous versions of the BCPM, the developers made no effort to explicitly cost out transport or signaling elements. Instead, they assumed that transport and signaling functions were 3 percent of switching investment. However, a major improvement with BCPM3.0 is the inclusion of a module to explicitly cost out transport—the Transport Cost Proxy Model (TCPM). BCPM3.0 also has a provision for a signaling module. At the current time, BCPM3.0 signaling costs are exogenously determined by the Signaling Cost Proxy Model (SCPM) that was run on US WEST territory. The signaling costs obtained from the SCPM run were then placed in BCPM3.0 as a fixed value.